

fluorine-containing gas that includes SF₆, Si₂F₆ and SiF₄, HBr and oxygen.

REMARKS

The claims have been amended to overcome the rejection under 35 USC 112. It should now be clear that the claimed etch composition must include HBr, oxygen and a fluorine-containing gas.

The claims have been amended to require that the etch composition be used with a biased substrate. Komura et al do not use bias on their substrate at all. However, biasing of the substrate is advantageous, as explained hereinbelow.

Claims 1-3 have been rejected under 35 USC 102(b) over Komura et al. Komura et al discloses a plasma etch gas of a bromine-containing gas, a cleaning gas, which can be a fluorine-containing gas, including SF₆ and a reactive gas, such as oxygen. Applicants however carry out their etch in a chamber that biases the substrate being etched. Komura's etch chambers do not bias the substrate at all.

The result of applying bias power to the substrate during etching is that a conformal fluorine-containing polymer forms on the sidewalls of the opening being etched, so that it is no

longer attacked by the etchant; biasing the substrate precludes formation of a polymer at the bottom of the etched opening. The result is that very high aspect ratio openings can be made; the etch mixture continues to attack the bottom of the opening, while the sidewalls are protected from further etching. Thus, very small diameter openings can be anisotropically etched. Since the polymer also deposits on the sidewalls of the mask, the selectivity to the mask remains high as well. Thus although the etch compositions of Komura et al are similar, the results are not.

Komura et al do not disclose biasing the substrate during etching, and indeed their exemplified etch chamber does not permit biasing the substrate. Thus applicants submit Komura et al did not recognize the advantages of biasing. These differing results means the reference does not render the present claims obvious either.

Claims 5-6 have also been rejected as obvious over Komura et al. These claims recite ratios of HBr to SF_6 and a combination of HBr and SF_6 to oxygen. But applicant submits these claims are patentable for the same reason that claims 1-3 are patentable, in that they require using a biased substrate, which Komura et al

does not and cannot use.

In fact, biasing of the substrate does produce an unexpected result, in that the sidewalls of etched openings are coated and protected during the etch, leaving only the bottom of the opening to be able to be further attacked by the etchant. Thus applicant submits these claims are also now allowable.

Claim 4, objected to as being based on a rejected base claim, has been rewritten in independent form. Thus this claim is now also allowable.

In view of the above amendments and discussion, applicant submits the claims are now allowable. Reconsideration and allowance of all of the claims are respectfully solicited. A clean copy of the claims as amended is attached hereto.

If the Examiner believes a telephone interview would advance the prosecution of this application, she is invited to contact the undersigned.


Docket No. AM1562D1

A Petition for an extension of the term for response is also attached. The fee therefor is charged to Deposit Account 13-4542.

Respectfully submitted,

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BY


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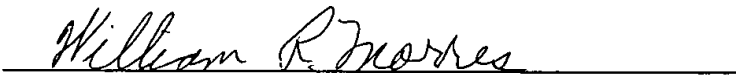
Please continue to send all correspondence to

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The undersigned declares that this correspondence is being deposited as first class mail with the United States Postal Service in an envelope addressed to the Assistant Commissioner for Patents, Washington, DC on April 3, 2002

William R. Morris

Person making deposit


Signature